

WHAT IS CLAIMED:

1. A device for securing webbing in a restraint system, the device comprising:
a frame having a first pivot member, a second pivot member and an opening therebetween;
a first cam member having a pivot member receiving portion, a web friction engaging portion on a first side, and a spring receiving portion on a second side;
a second cam member having a pivot member receiving portion, a web friction engaging portion on a first side, and a spring receiving portion on a second side, the cam members arranged with the web friction engaging portions adjacent one another, and the spring receiving portions facing away from the adjacent web friction engaging portions; and
a continuous compression spring extending around the cam members and being received by the spring receiving portions, whereby the continuous compression spring maintains the cam members in an engaging relationship and a web may be received through the opening.
2. The device of claim 1, wherein the frame member includes a first plate extending along a first side of the cam members, and a second plate extending along a second side of the cam members, the second frame member is spaced apart from the first frame member with the one plate parallel to, and spaced apart from, the other plate, the plates defining an area there between, the cam members arranged within the area, with the web friction engaging portions adjacent one another, and the spring receiving portions facing away from the area and, together with the plates, defining a perimeter, the continuous compression spring extending about the perimeter.
3. The device of claim 2, wherein the frame first and second pivot members each include a rod, the cam pivot member receiving portions each include a bore which pivotally

receives a respective rod, the web friction engaging portions include ridges, and the spring receiving portions each include a recess for receiving the continuous compression spring.

4. The device of claim 1, wherein with the cam members are arranged to define a tangent at a point the cam members are adjacent one another, and the web friction engaging portions are offset from the tangent in a common direction, whereby the friction engaging portions of each cam contact either side of a piece of webbing material in a way that allows the webbing to pass easily in one direction but not in the opposite direction, so that a user of this device may pull the webbing through the device such that upon release of the web, the device restrains the web and resists high levels of tensile stress.

5. The device of claim 4, wherein each cam member includes a protruding handle, the handle extending from adjacent the spring receiving portion, towards the common direction of the offset.

6. The device of claim 1, wherein with the cam members are arranged to define a tangent at a point the cam members are adjacent one another, and the web friction engaging portions each include ridges which extend in a common direction away from the tangent, whereby the friction engaging portions of each cam contact either side of a piece of webbing material in a way that allows the webbing to pass easily in one direction but not in the opposite direction, so that a user of this device may pull the webbing through the device such that upon release of the web, the device restrains the web and resists high levels of tensile stress.

7. The device of claim 1, further comprising a shaft having a first end and a second end, the first end extending from a side of one of the cam members, whereby the shaft is biased

in the same direction as the one cam member, and the user may rotate the shaft away from the direction of bias so as to move the cam members away from the engaging relationship.

8. The device of claim 7, wherein the second end of the shaft includes a handle and a means for releasably locking the shaft to prevent rotational movement.

9. A device for securing webbing in a restraint system, the device comprising:
a frame having a first pivot member, a support member and an opening therebetween;

a first cam member having a pivot member receiving portion, a web friction engaging portion on a first side, and a spring receiving portion on a second side;

a second cam member having a support member receiving portion, a web friction engaging portion on a first side, and a spring receiving portion on a second side, the cam members arranged with the web friction engaging portions adjacent one another, and the spring receiving portions facing away from the adjacent web friction engaging portions; and

a continuous compression spring extending around the cam members and being received by the spring receiving portions, whereby the continuous compression spring maintains the cam members in an engaging relationship and a web may be received through the opening.

10. The device of claim 9, further comprising a shaft having a first end and a second end, the first end extending from a side of one of the cam members, whereby the shaft is biased in the same direction as the one cam member, and the user may rotate the shaft away from the direction of bias so as to move the cam members away from the engaging relationship.

11. The device of claim 10, wherein the second end of the shaft includes a handle and a means for releasably locking the shaft to prevent rotational movement.

12. A device for securing webbing in a restraint system, the device comprising:
a frame having a first side and a second side, a first pivot spring member extending between the first and second sides, a second pivot spring member parallel to and spaced apart from the first pivot spring member and extending between the first and second sides, and a web receiving opening between the first and second pivot spring members;
a first cam member having a pivot spring member receiving portion, and a web friction engaging portion on a first side;
a second cam member having a pivot spring member receiving portion, and a web friction engaging portion on a first side, the cam members arranged with the web friction engaging portions adjacent one another, whereby the pivot spring members maintain the cam members in an engaging relationship and a web may be received through the web receiving opening.
13. The device of claim 12, wherein the pivot spring member receiving portions include a bore extending through the respective cam member, and the pivot spring members extend through the respective bore and include a torsion spring having one end secured to one of the frame sides, and another end is secured to the respective cam member, the frame having a stop, and one of the cam members includes a recess for receiving the stop to limit the rotational freedom of the web friction engaging portion, of the one cam member, towards the web friction engaging portion of the other cam member.
14. The device of claim 13, further comprising a first bar extending between the frame sides and through one of the torsion springs, and a second bar extending between the frame sides and through the other torsion spring.

15. The device of claim 12, further comprising a shaft having a first end and a second end, the first end extending from a side of one of the cam members, whereby the shaft is biased in the same direction as the one cam member, and the user may rotate the shaft away from the direction of bias so as to move the cam members away from the engaging relationship.

16. The device of claim 15, wherein the second end of the shaft includes a handle and a means for releasably locking the shaft to prevent rotational movement.

17. A device for securing webbing in a restraint system, the device comprising:

- a frame having a first pivot member, a second pivot member and a web receiving opening therebetween;
- a first cam member having a pivot member receiving portion, and a web friction engaging cam surface;
- a spring biasing the web friction engaging cam surface towards the web receiving opening;
- a second cam member having a pivot member receiving portion, a web friction engaging cam surface;
- a lobe located on one of the cam members and extending generally towards the opening; and
- a lobe recess located on the other cam member, the cam members arranged so that movement of the first cam member under spring bias causes the lobe and lobe recess to engage, and urge the web friction engaging cam surfaces towards each other so as to pinch off the opening.

18. The device of claim 17, wherein the first cam member includes the lobe, and the second cam member includes the lobe recess, each pivot member is an axle, and each of the pivot member receiving portions is a bore which receives a respective axle.

19. The device of claim 17, wherein one of the cam members includes a handle towards and beyond the web friction engaging cam surfaces, whereby operation of the handle and the interaction of the lobe and lobe recess, cause both cam members to pivot away from the web receiving opening and towards a web releasing direction.

20. The device of claim 17, further comprising a shaft having a first end and a second end, the first end extending from a side of one of the cam members, whereby the shaft is biased in the same direction as the one cam member, and the user may rotate the shaft away from the direction of bias so as to move the cam members away from the engaging relationship.

21. The device of claim 20, wherein the second end of the shaft includes a handle and a means for releasably locking the shaft to prevent rotational movement.

22. A child restraint system comprising:

a seat having a seat portion and a back portion, and the back portion includes at least one through hole;

a belt adjuster located in front of the seat portion;

a first belt attachment portion secured to the seat portion;

a second belt attachment portion which is capable of attachment to the first belt attachment portion; and

a harness assembly including a belt extending from the seat portion and attached to the second belt attachment portion, extending up the back portion, through the at least one through hole, down the back portion, under the seat portion and through the belt adjuster at the front of the seat portion, whereby a web hangar is not required.

23. The system of claim 22, wherein the harness assembly includes continuous loop of webbing.

24. The system of claim 23, wherein the seat portion includes a first through hole at one side of the seat portion and a second through hole at another side of the seat portion, the webbing extends through the through holes of the seat portion and under the seat portion, and below the webbing extending towards the adjuster, and an end of the webbing loop extends out of the adjuster, with two layers of webbing extending through the adjuster, whereby the harness is adjustable by grasping the webbing loop end and pulling so as to remove slack from the harness, and by releasing the adjuster so as to allow slack to be introduced into the harness.

25. The system of claim 22, wherein the first belt attachment portion is a buckle secured to the seat portion, and the second belt attachment portion includes a first and second tongue of which are capable of being lockingly received by the buckle, and wherein each of the tongues include a web loop for being slidably received by a respective web extending up the back portion.

26. A child restraint system comprising:

a seat having a seat portion and a back portion, and the back portion includes at least one through hole;

a belt adjuster located under the seat portion and towards the general direction of the back portion;

a first belt attachment portion secured to the seat portion;

a second belt attachment portion which is capable of attachment to the first belt attachment portion; and

a harness assembly including a belt extending from the seat portion and attached to the second belt attachment portion, extending up the back portion, through the at least one through hole, down the back portion, and through the belt adjuster, whereby a web hangar is not required.

27. A device for securing a harness in a restraint system, the device comprising:

a frame having a base;

a belt having a plurality of contiguous abutment members, a portion of the belt extending along the base and being adaptable for coupling to the harness;

a ratchet tooth member having a belt engaging member at one end, the ratchet tooth member mounted to the frame for movement between a first position wherein the engaging member is spaced away from the base, and a second position wherein the engaging member extends towards the base in an incline angle with respect to the base; and

a spring secured to the frame in a biased relation with the ratchet tooth member, urging the belt engaging member towards the second position, whereby the spring maintains the belt engaging member in an engaging relationship with belt.

28. The device of claim 27, wherein the ratchet tooth member includes a first and second side, and a guide ear on each side, and the base includes a pair of spaced apart and opposing walls, each wall having an angled slot, the pair of angled slots aligned with one another

and receiving a respective guide ear of the ratchet tooth member, whereby the guide ears and angled slots allow linear movement of the ratchet tooth member between the first and second positions.

29. The device of claim 27, wherein the base includes a substantially flat portion which receives a portion of the belt.

30. The device of claim 27, wherein the ratchet tooth member includes a top portion, and the spring is biased against the top portion, urging the ratchet tooth member towards the second position and in engagement with the belt.

31. The device of claim 27, wherein the belt includes a longitudinally extending strip having a plurality of openings spaced one after the other, and the belt engaging member is sized so as to fit in one of the openings.

32. The device of claim 27, further comprising a release mechanism.

33. The device of claim 32, wherein the release mechanism includes a rod aligned with a top portion of the ratchet tooth member for urging the ratchet tooth member against the force of the spring and towards the direction of the first position, whereby the position of the belt with respect to the frame may be adjusted.

34. The device of claim 27, wherein the ratchet tooth member includes a first and second side, and a guide ear on each side, and the base includes a pair of spaced apart and opposing walls, each wall having an opening, the pair of openings aligned with one another and receiving a respective guide ear of the ratchet tooth member, whereby the guide ears and openings allow pivotal movement of the ratchet tooth member between the first and second positions.

35. The device of claim 27, wherein the belt includes a longitudinally extending strip having a plurality of teeth spaced one after the other, each tooth extends towards the ratchet tooth member and has an inclined leading edge and a trailing edge which is perpendicular to the longitudinal axis of the belt, whereby the ratchet tooth member allows the belt to move in a direction with the leading edge leading the respective trailing edge, but engages in a locking manner with the belt when the belt moves in a direction with the trailing edge leading the leading edge.

36. The device of claim 27, wherein the belt includes a longitudinally extending strip having sides and a plurality of teeth extending outward from each side and spaced one after the other.

37. The device of claim 36, wherein the teeth on one side are spaced out of alignment with the teeth of the other side, whereby the belt is adjustable with respect to the frame with increase resolution.

38. The device of claim 36, wherein the teeth are rectangular shaped.

39. The device of claim 36, wherein each tooth has an inclined leading edge and a trailing edge which is perpendicular to the longitudinal axis of the belt, whereby the ratchet tooth member allows the belt to move in a direction with the leading edge leading the respective trailing edge, but engages in a locking manner with the belt when the belt moves in a direction with the trailing edge leading the leading edge.

40. The device of claim 27, wherein the belt includes a longitudinally extending string having plurality of balls spaced one after the other, whereby the ratchet tooth member engages the belt in a space between two consecutive balls.

41. The device of claim 27, wherein the belt includes a longitudinally extending chain having plurality of links spaced one after the other, each link includes a loop with a neck extending from the loop into a hook, the loop defining an opening, whereby the ratchet tooth member can be adapted to engage the belt at either the neck or the opening.

42. The device of claim 27, wherein the ratchet tooth member includes a notch at the center of the belt engaging member, and wherein the belt includes a main body portion which is received within the notch.

43. The device of claim 42, wherein the notch defines a stop on each side of the notch, the length of the stop defined by the depth of the notch, whereby the stops limit the downward movement of the belt engaging member onto the belt.

44. The device of claim 43, wherein the notch includes two side edges which are bridged by a main edge, each side edge defines a portion of a respective stop.

45. The device of claim 44, wherein the side edges engage the belt.

46. The device of claim 44, wherein the main edge engages the belt.

47. The device of claim 43, wherein the ratchet tooth member includes a main wall portion, and a flange portion contiguous with the main wall portion and at an angle with respect to the main wall portion, and wherein the flange portion includes the notch and stops, the main wall portion includes a hinged portion for pivotally coupling to the frame.